

AN EVALUATION

Bridge Inspection Program

Department of Transportation

01-17

October 2001

2001-2002 Joint Legislative Audit Committee Members

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CONTENTS

Letter of Transmittal	1
Summary	3
Introduction	7
Bridge Inspection Process	8
Condition of Wisconsin's Bridges	12
Expenditures and Staffing	17
Inspection Expenditures	17
Expenditures for State-Staffed Inspections	19
State Staff Qualifications	22
Expenditures for Consultant-Staffed Inspections	22
Consultant Evaluations	25
Bridge Inspection Issues	29
Frequency of Routine Inspections	29
Routine Bridge Maintenance	34
Maintenance Expenditures	35
District Oversight of Maintenance Work	37
Other Inspection Issues	38
Average Daily Traffic Counts	39
Master Bridge Lists	40
Hoan Bridge	41
Hoan Bridge Failure	41
Inspection History	44
Routine Inspections	44
Fracture Critical Inspections	45
Inspection of Bridges Similar to the Hoan Bridge	46
Appendix 1—Structurally Deficient Bridges, by District and County	
Appendix 2—Bridge Maintenance Expenditures, by District and County	
Appendix 3—Response from the Department of Transportation	



State of Wisconsin \ LEGISLATIVE AUDIT BUREAU

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October 25, 2001

Senator Gary R. George and
Representative Joseph K. Leibham, Co-chairpersons
Joint Legislative Audit Committee
State Capitol
Madison, WI 53702

Dear Senator George and Representative Leibham:

We have completed an evaluation of the Department of Transportation's bridge inspection program, as requested by the Joint Legislative Audit Committee. In fiscal year 2000-01, the Department spent approximately \$2.2 million in segregated state funds to inspect state-owned bridges, including an estimated \$1.2 million to hire consultants from the private sector.

The Department's written policies for inspecting the 4,858 state-owned bridges are generally consistent with federal regulations and other national guidelines, and state staff meet federal bridge inspection qualifications. The Department does not, however, adequately monitor bridge inspection costs or evaluate the cost-effectiveness of its use of consultants by comparing their costs to the costs of inspections performed by state staff. It also does not use the most recent data on bridge traffic to measure the condition of state bridges. We have included recommendations to address these concerns.

The Department has increased staff time devoted to bridge inspection. However, we found that from January 2000 through August 2001, 15.9 percent of routine bridge inspections and 8.0 percent of inspections of structurally deficient bridges were not completed within the two-year period required by both state and federal law. Therefore, we have also included a recommendation that the Department ensure inspections are completed in a timely manner.

National bridge experts have determined that the Department could not have foreseen the failure of the Hoan Bridge in Milwaukee in December 2000. We found, however, that the Department had not conducted routine inspections of the bridge as frequently as required by law. The Department estimates that the bridge repair work will cost approximately \$15.8 million.

We appreciate the courtesy and cooperation extended to us by the Department. The Department's response is Appendix 3.

Respectfully submitted,

A handwritten signature in cursive script that reads "Janice Mueller".

Janice Mueller
State Auditor

JM/KW/ss

Summary

Bridge inspections allow the Department of Transportation to assess current structural conditions, anticipate future problems, and identify needed maintenance work. In fiscal year (FY) 2000-01, the Department used 12.99 full-time equivalent (FTE) staff positions and spent an estimated \$2.2 million on inspection activities. In addition to routine inspections of every bridge, which have been required to be performed every two years since January 2000, the Department performs six other types of inspections, including more detailed inspections of bridges with deficiencies or particular design features.

Three supporting girders of the Daniel Webster Hoan Bridge in the City of Milwaukee cracked on December 13, 2000, which resulted in the bridge's structural failure and raised concerns about the adequacy of the Department's bridge inspection program. Consequently, at the direction of the Joint Legislative Audit Committee, we reviewed bridge inspection program expenditure and staffing levels, as well as applicable inspection policies and procedures; examined the use of private consultants to inspect bridges; and determined whether the Department had inspected the Hoan Bridge as frequently as required by law.

State staff located in eight districts conduct most inspections of the 4,858 state-owned bridges, but central office staff conduct in-depth and other complex inspections, and the Department also contracts with private consultants. The Waukesha district, in which the Hoan Bridge is located, also hires private consultants to conduct routine inspections. The number of FTE staff positions devoted to bridge inspections increased by 24.0 percent, from 10.48 to 12.99, from FY 1999-2000 to FY 2000-01. We found that the Department's written bridge inspection procedures are generally consistent with national regulations and guidelines, and its inspectors meet the minimum federal qualifications.

The Department reports the results of its routine inspections to the Federal Highway Administration, which then classifies as structurally deficient any bridges that are becoming unsafe. In 2000, 8.8 percent of state-owned bridges were classified as structurally deficient, and Wisconsin had the third-highest percentage of structurally deficient bridges among seven midwestern states. However, the number of structurally deficient bridges has declined from 473 in 1996 to 420 in 2000. As of July 2001, 2 state-owned bridges were fully or partially closed, and 44 had weight restrictions because of structural deficiencies.

The Department does not maintain detailed expenditure information for the bridge inspection program, but it estimates that expenditures increased 74.7 percent from FY 1999-2000 to FY 2000-01. Officials attribute some of the increase to additional work involved with the Hoan Bridge failure and the inspection of 21 other state-owned bridges with similar structural configurations. However, they could not explain annual variations in program expenditures and staffing levels over the past five fiscal years. Further, the Department does not adequately monitor its costs for state staff and consultants or evaluate the cost-effectiveness of its use of consultants, particularly for routine inspections. While it is the Department's policy to evaluate the performance of consulting firms at the end of every contract, evaluations were completed for only 6 of the 25 contracts on which work was completed from March 1996 through April 2000, and on average, the evaluations were completed more than a year after the contracts had ended.

We also noted concerns with the timeliness of routine inspections. From 1996 through 1999, when state administrative code required routine inspections to be performed annually, only 46.6 percent were completed within the required inspection interval, while 53.4 percent were not. In 1999, administrative code was changed to require a 24-month inspection interval, which is consistent with federal requirements.

Although more staff time has been devoted to bridge inspection since the administrative code change, we found that the Department's completion of routine inspections within the federally required 24-month interval has not improved. In fact, the percentage of routine inspections not completed within 24 months is increasing. From January 2000 through August 2001, 15.9 percent of inspections statewide were not completed within 24 months. In contrast, only 1.5 percent had not been completed within the federally required interval from 1996 through 1999. We could not determine from available data whether the difference occurred because routine inspections have become more rigorous, more time is being spent conducting in-depth inspections and examining bridges with structural deficiencies, or staff are becoming less efficient.

Because inspecting bridges that have deteriorated or developed structural problems is particularly important, we also examined the inspection histories of bridges categorized as structurally deficient. From January 2000 through August 2001, 393 structurally deficient bridges were inspected, in some cases more than once. We found that 92.0 percent of inspections of structurally deficient bridges were completed within 24 months of a prior inspection, but 32 inspections, or 8.0 percent of the total, were completed more than 24 months after a prior inspection.

The Department's central office does not provide districts with guidelines for scheduling inspections or require districts to submit inspection schedules. To ensure that both routine inspections and inspections of structurally deficient bridges are completed in a timely manner, we include a recommendation that each of the Department's eight districts provide the central office with semiannual reports explaining how they will complete all bridge inspections within the required 24-month interval, and that the central office provide the districts with information on bridges that state and federal law require to be inspected in the next six months.

Routine bridge maintenance work that has been identified by inspectors is typically completed by counties. In 2000, counties spent \$4.7 million to clean bridge decks and water drains of debris, reseal joints between concrete slabs on bridge decks, trim overgrown brush, and complete other required bridge maintenance work. State staff spent an estimated \$723,300 on bridge maintenance activities in FY 2000-01.

Officials in the Department and the Federal Highway Administration believe the Department has sufficient funding to address the highest-priority bridge maintenance needs. However, some lower-priority projects are not completed, and inspectors in five of the Department's eight districts, as well as Federal Highway Administration officials, have noted that some counties do not complete maintenance work in a timely manner. Only two districts have implemented procedures to verify that maintenance work has actually been completed. Districts are also generally unable to monitor counties' bridge maintenance expenditures, which the Department reimburses. Therefore, we have suggested that the Department develop procedures for districts to use in monitoring and documenting the completion of routine bridge maintenance work.

We also include recommendations concerning the Department's record-keeping related to the bridge inspection program. A bridge's average daily traffic count is one factor that determines its condition, and this determines, in part, the amount of federal bridge replacement and rehabilitation program funding the Department receives. Traffic counts in the Department's bridge inspection database are outdated for two-thirds of all state bridges. The Department also does not maintain a master list of bridges with underwater components, as required by federal regulations.

Finally, we found the Department did not always complete annual routine inspections of the Hoan Bridge from 1993 through 1999, and it did not complete more detailed inspections as frequently as required. The Waukesha district, which is responsible for inspecting the bridge, indicates that too few staff are available to complete some of the inspections and that there are insufficient funds to hire consultants.

National bridge experts and Federal Highway Administration officials examined the Hoan Bridge after it failed and determined that the cracks that caused its failure developed so suddenly and unexpectedly that the Department's inspections could not have detected them. Repairing and retrofitting the bridge is estimated to cost \$15.8 million, and federal funds are expected to pay for 80 percent of this cost.

Introduction

State and federal law require the Department to inspect state bridges every two years.

The Department of Transportation is required by federal and state law to inspect all bridges owned or maintained by the State at regular intervals that do not exceed two years. Department of Transportation staff conduct most bridge inspections, but certain specialized inspections are conducted by private-sector consultants, who also help to complete routine inspections. In fiscal year (FY) 2000-01, 12.99 full-time equivalent (FTE) staff positions in the Department were used to inspect bridges, and the Department spent an estimated \$2.2 million in segregated state funds on inspection activities.

Federal regulations and state administrative code define a bridge as a structure longer than 20 feet that carries traffic over a depression or obstruction. The purpose of a bridge inspection is to ascertain the structure's current condition and to anticipate future problems. An inspection allows the Department to rate a bridge's safety and serviceability, provides a continuous record of a bridge's condition and rate of deterioration, and helps the Department determine whether to impose vehicle weight limits or to close the bridge. Officials in the Department use inspection results to initiate routine bridge maintenance activities, such as repairing damaged guard rails, or to plan large rehabilitation projects, such as reconstructing the entire bridge.

Concerns about the Department's bridge inspection program were raised when three supporting girders under the Daniel Webster Hoan Bridge along Interstate 794 in the City of Milwaukee cracked on December 13, 2000, resulting in the bridge's structural failure and closure to traffic. This incident occurred two months after the most recent inspection was completed. At the direction of the Joint Legislative Audit Committee, we:

- reviewed bridge inspection program expenditure and staffing levels;
- reviewed the Department's policies and procedures for inspecting state bridges;
- examined the Department's use of private-sector consultants to conduct inspections; and
- determined whether the Department had inspected the Hoan Bridge as frequently as required by law.

In conducting this evaluation, we:

- reviewed applicable federal regulations, state statutes, and state administrative code;
- observed 22 bridge inspections in three of the Department's eight districts;
- interviewed bridge inspectors in the central office and all eight district offices;
- analyzed expenditure, inspection, and bridge condition data maintained by the Department and the Federal Highway Administration;
- reviewed Hoan Bridge inspection reports from the last nine years; and
- interviewed officials of the Federal Highway Administration, transportation agencies in six other midwestern states, and several transportation associations in Wisconsin.

We did not review the inspection process for 8,630 local bridges in Wisconsin, which are located on roadways other than the state trunk highway system. Local governments are responsible for inspecting these bridges, although administrative code requires the Department to ensure that local bridges are inspected at least once every two years. If a local government fails to inspect a bridge, the Department is required to direct the applicable county highway commissioner to perform the inspection.

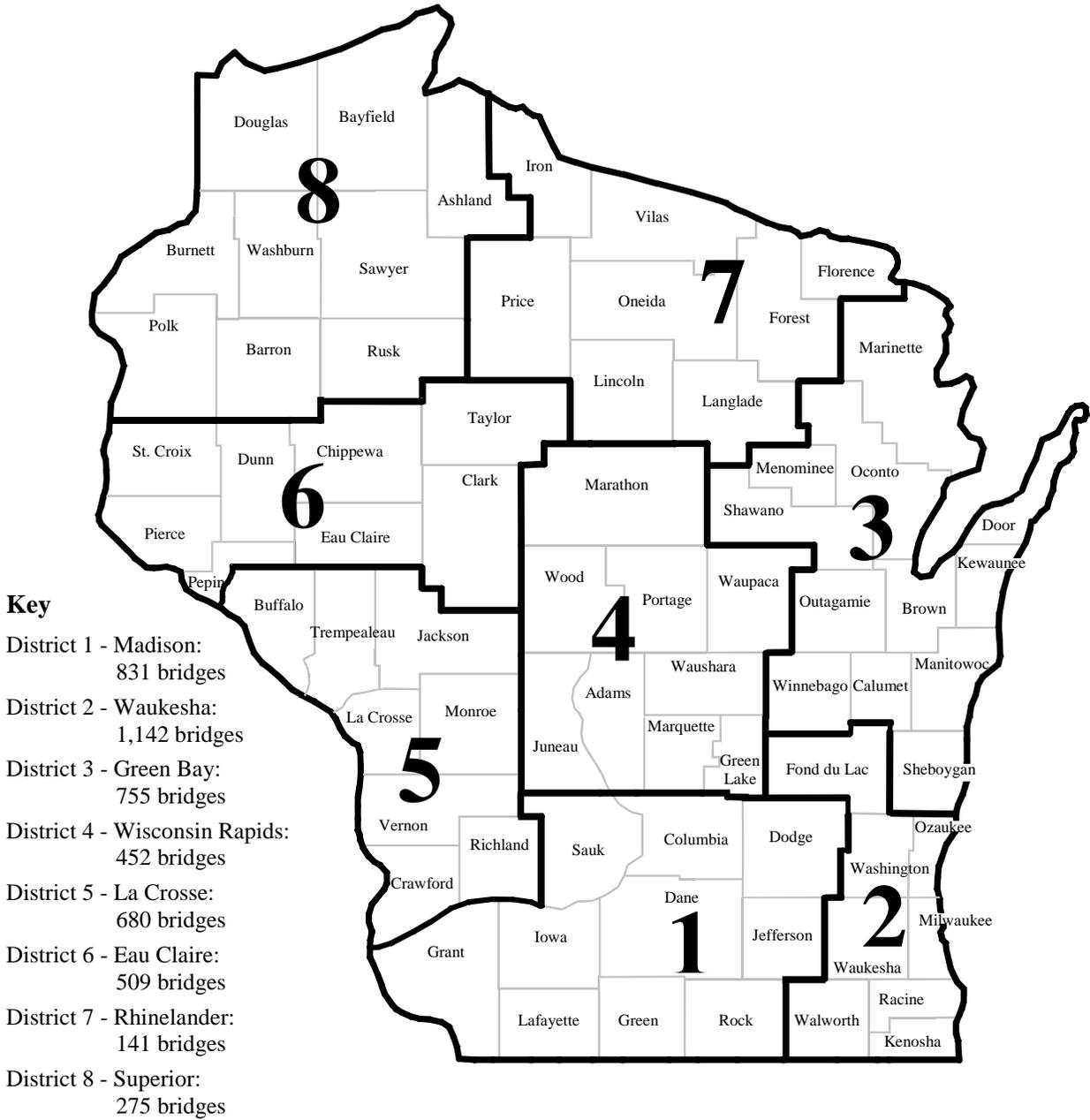
Bridge Inspection Process

Staff in the Department's eight districts conduct most bridge inspections.

Staff in the Department's eight districts conduct most bridge inspections. Figure 1 shows the location of the eight districts, as well as the number of state-owned bridges in each district in 2000. The Waukesha district had 1,142 bridges, the most in the state, while the Rhinelander district had 141 bridges, the fewest.

Figure 1

**Department of Transportation Districts
2000**



The Department's written inspection procedures are generally consistent with national regulations.

The Department's written bridge inspection procedures are generally consistent with the regulations and guidelines promulgated by the Federal Highway Administration and the American Association of State Highway Transportation Officials, a nonprofit and nonpartisan national organization. The Federal Highway Administration conducts a quality assurance review in two of the Department's districts annually to ensure, in part, that the inspection guidelines are followed.

The majority of inspections are routine inspections.

Regularly scheduled routine inspections account for the majority of inspections conducted on state-owned bridges. These are required by federal law and state administrative code to be completed on each bridge at regular intervals, which typically are not to exceed two years. The inspection interval of a bridge may be increased up to four years if prior inspections, favorable experience, and the Department's analysis of the bridge's condition justify this extension, and if the Federal Highway Administration agrees. However, all state bridges in Wisconsin are currently required to be inspected once every two years.

The Department also conducts six other types of bridge inspections:

- inventory—the initial inspection, conducted within 90 days after a bridge has been constructed or reconstructed, to determine its baseline structural condition;
- in-depth—an intensive inspection that uses special equipment or techniques to follow up on deficiencies noted during routine inspections;
- underwater—an inspection to appraise a bridge's underwater features that cannot be visually inspected from above the water, which federal regulations require to be conducted every five years;
- fracture critical—an inspection to assess the condition of bridge components, such as girders, whose failure may result in the bridge's collapse, completed every six years on the 150 state bridges that have fracture critical components, including the Hoan Bridge;
- damage—an unscheduled inspection to assess structural damage resulting from human or environmental factors; and
- interim—an inspection to monitor a known or suspected deficiency, conducted at intervals less than every two years.

Inspections are conducted year-round. Because temperature and weather affect a bridge's condition, inspectors try to inspect a given bridge at different times of the year from one inspection cycle to the next. Before conducting an inspection, an inspector typically examines the bridge's design plans and prior inspection reports, notes the bridge's age and its condition at the time of the prior inspection, and reviews recently completed repair and maintenance work. This information allows the inspector to formulate a plan for inspecting the bridge, including any features or structural configurations that may need special attention. In addition, the inspector determines whether the district plans to complete rehabilitation work, such as resurfacing the bridge, in the near future.

Most routine inspections take less than one day to complete, and some take less than an hour, although inspections of bridges with complex designs or structural problems can last several days. Inspectors visually assess all aspects of a bridge's condition, including the bridge deck, which is the surface on which vehicles travel; the superstructure, which includes the girders and other features that support the bridge deck; and the substructure, which includes the piers and other features that support the superstructure. Inspectors determine, for example, whether:

- cracks that may affect the bridge's structural integrity are present;
- concrete pylons and supports are deteriorating;
- water flowing under the bridge has deteriorated the substructure or the soil around the bridge;
- metal girders are corroded, cracked, or need repainting; and
- potholes are forming on the bridge deck, or the pavement around the bridge is rough.

Inspectors assess bridges' structural integrity and identify needed maintenance work.

In addition to assessing a bridge's structural integrity, inspectors determine whether routine maintenance is needed. Such work includes cleaning the bridge deck and water drains of debris, resealing the joints between concrete slabs on the bridge deck, or trimming overgrown brush around the bridge. Almost all routine maintenance work identified by the inspectors is performed by county highway departments, which are then reimbursed by the Department.

Inspectors complete a standardized report after each routine inspection. They note the overall condition of the bridge deck, superstructure, and substructure; determine more specific ratings for various bridge parts, such as the concrete, steel beams and braces, and bridge railings; and provide written comments about the bridge. Districts keep paper copies

of the reports and enter the information into an electronic database to which the central office has access. District supervisors do not typically review the inspection reports.

For inspection purposes, the Department considers some larger bridges to comprise multiple bridge units, each of which is inspected separately, as if it were a separate bridge. As of April 1, 2001, Wisconsin had 4,473 single-unit state bridges and 30 multi-unit bridges with a combined 385 units, for a total of 4,858 state bridge units statewide. In our analyses, we considered each bridge unit to be a separate bridge.

Condition of Wisconsin's Bridges

The Federal Highway Administration annually requires states to report various aspects of each bridge on a standardized scale. Depending upon this information, a bridge may be classified as structurally deficient, indicating that its condition is becoming unsafe. A structurally deficient bridge may require immediate rehabilitation to remain open, may be restricted to lighter vehicles, or may be closed.

The percentage of structurally deficient state bridges declined from 1996 through 2000.

As shown in Table 1, 8.8 percent of all state-owned bridges in Wisconsin were classified as structurally deficient in 2000, which is a decline from 10.3 percent in 1996. However, Wisconsin had the third-highest percentage of structurally deficient bridges among seven midwestern states in 2000. No more than 8.5 percent of state bridges are to be classified as structurally deficient in 2001, according to a departmental goal that was included in the Governor's 2001-03 Executive Budget.

Table 1

Percentage of State-Owned Bridges Rated Structurally Deficient, by State
1996 to 2000

<u>State</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
Indiana	4.7%	4.1%	3.3%	3.2%	2.9%
Iowa	3.2	3.0	3.1	3.2	4.2
Minnesota	8.1	6.8	6.6	5.9	5.3
Ohio	9.9	9.3	8.7	6.9	6.1
Wisconsin	10.3	10.4	10.0	9.4	8.8
Illinois	13.4	15.2	14.8	11.4	9.4
Michigan	20.7	20.5	19.3	20.3	21.6
U.S.	10.7	10.4	9.9	9.2	9.1

As shown in Table 2, the number of structurally deficient state bridges declined from 473 in 1996 to 420 in 2000, or by 11.2 percent. The number of structurally deficient bridges declined over the five-year period in every district except Green Bay and Eau Claire; the number was unchanged in Superior. The Waukesha district had almost twice as many structurally deficient bridges as any other district. Appendix 1 shows the number and percentage of structurally deficient bridges in each county.

Table 2

Number of State-Owned Bridges Rated Structurally Deficient, by District
1996 to 2000

<u>District</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>Percentage Change</u>
Madison	94	92	83	73	58	(38.3%)
Waukesha	146	173	168	138	124	(15.1)
Green Bay	37	40	54	56	60	62.2
Wisconsin Rapids	23	21	19	20	18	(21.7)
La Crosse	69	65	68	67	61	(11.6)
Eau Claire	64	53	50	58	66	3.1
Rhineland	14	12	10	7	7	(50.0)
Superior	<u>26</u>	<u>25</u>	<u>21</u>	<u>24</u>	<u>26</u>	0.0
Total	473	481	473	443	420	(11.2)

In July 2001, 44 state-owned bridges had weight restrictions.

The Department may restrict a bridge's weight limit or close a bridge to all traffic if inspectors determine that structural conditions warrant this action. In July 2001, only the northbound lanes of the Hoan Bridge and a bridge along State Highway 253 in Washburn County were closed. However, 44 state-owned bridges had weight restrictions, including:

- 15 bridges in the Waukesha district;
- 9 bridges in the Green Bay district;
- 7 bridges in the La Crosse district;
- 5 bridges in the Madison district;
- 4 bridges in the Superior district;
- 3 bridges in the Eau Claire district; and
- 1 bridge in the Wisconsin Rapids district.

Bridges are typically built to last for approximately 75 years. As indicated in Table 3, approximately three-fourths of state-owned bridges in Wisconsin were 40 years old or less in July 2001 and, therefore, likely will be open to traffic for many more years. Approximately one-fourth of state-owned bridges were older than 40 years.

Table 3

Age of State-Owned Bridges in Wisconsin
July 2001

<u>Age of Bridge</u>	<u>Number of Bridges</u>	<u>Percentage</u>
10 years or less	856	17.6%
11 to 20 years	605	12.5
21 to 30 years	912	18.8
31 to 40 years	1,347	27.7
41 to 50 years	585	12.0
51 to 60 years	151	3.1
61 to 70 years	282	5.8
71 to 80 years	103	2.1
More than 80 years	17	0.4

Expenditures and Staffing

The Department does not maintain complete bridge inspection expenditure information.

Effective operation and management of the bridge inspection program require the Department to monitor program expenditures and to hire qualified bridge inspectors. Within the Department, district staff conduct most inspections, although central office staff conduct in-depth and other complex inspections, operate specialized bridge inspection equipment that provides access to the undersides of large bridges, provide technical expertise and training, and help the Federal Highway Administration conduct quality-assurance reviews of the districts. As noted, the Department also contracts with private consulting firms to conduct inspections. The Department's bridge inspectors currently meet the minimum professional qualifications required by federal and state regulations. However, we found that the Department does not maintain complete program expenditure information or determine whether it is cost-effective to hire consultants to complete routine bridge inspections.

Inspection Expenditures

The bridge inspection program is administered within the Department's maintenance and traffic operations program, which spent a total of \$172.6 million on all activities in FY 2000-01. The Department does not, however, maintain detailed expenditure information for the bridge inspection program. Therefore, we used time-reporting records to estimate expenditures for the salaries and fringe benefits of state program staff. The Department estimated that other program costs incurred by state staff, such as those associated with equipment, traffic control, and travel, make up 17 percent of the Department's overall maintenance and traffic operations program expenditures. In the absence of detailed information, they also estimated that equipment, traffic control, and travel costs make up 17 percent of bridge inspection program costs.

The Department spent an estimated \$2.2 million for bridge inspections in FY 2000-01.

Based on these estimates, the Department spent an estimated \$2.2 million in segregated state funds for bridge inspections by state staff and consultants in FY 2000-01. Expenditures from FY 1996-97 through FY 2000-01 are shown in Table 4.

While there is no clear pattern of total expenditures increasing or decreasing during this period, it appears that much of the 74.7 percent increase from FY 1999-2000 to FY 2000-01 occurred within the central office. Officials in the Department report that a portion of the additional costs was incurred as a result of the Hoan Bridge failure, as well as inspections of 21 other state-owned bridges with structural configurations similar to the Hoan Bridge's. However, officials could not explain other annual changes in program expenditures or the variations among the districts.

Table 4

Estimated Bridge Inspection Program Expenditures, by District*

<u>District</u>	<u>FY 1996-97</u>	<u>FY 1997-98</u>	<u>FY 1998-99</u>	<u>FY 1999-2000</u>	<u>FY 2000-01</u>
Madison	\$ 97,700	\$ 88,500	\$ 75,100	\$ 78,500	\$ 108,600
Waukesha	1,099,300	425,500	452,300	640,200	507,400
Green Bay	83,500	66,000	46,700	93,000	149,200
Wisconsin Rapids	81,600	85,700	113,300	73,000	128,000
La Crosse	101,800	76,800	50,100	24,600	71,200
Eau Claire	93,300	148,800	137,000	79,200	125,400
Rhineland	25,300	19,400	10,800	17,800	20,700
Superior	37,200	39,600	48,300	86,900	69,100
Central Office	<u>140,600</u>	<u>615,600</u>	<u>203,100</u>	<u>182,900</u>	<u>1,049,300</u>
Total	\$1,760,300	\$1,565,900	\$1,136,700	\$1,276,100	\$2,228,900

* Includes estimated staff salaries, as well as amounts incurred by state staff for bridge inspection equipment, traffic control, and travel.

Expenditures for State-Staffed Inspections

As shown in Table 5, expenditures for state-staffed bridge inspections were an estimated \$1.0 million in FY 2000-01, an increase of almost 50 percent from the prior fiscal year. This expenditure information includes salary and fringe benefits costs for inspection activities, as well as an estimate of equipment, traffic control, and travel costs incurred by state inspection staff. The Department attributes part of the increase to the creation of two additional full-time positions in the central office in September 2000 to operate specialized bridge inspection equipment, and to increases in state employee engineering salaries, effective in October 2000 and January 2001, to make them more competitive with private-sector salaries.

Table 5

Estimated Expenditures for State-Staffed Bridge Inspections, by District

<u>District</u>	<u>FY 1996-97</u>	<u>FY 1997-98</u>	<u>FY 1998-99</u>	<u>FY 1999-2000</u>	<u>FY 2000-01</u>
Madison	\$ 97,700	\$ 88,500	\$ 75,100	\$ 78,500	\$ 108,600
Waukesha	62,100	78,800	54,900	78,000	83,100
Green Bay	83,500	66,000	43,400	92,900	149,200
Wisconsin Rapids	81,600	79,500	60,800	61,600	120,200
La Crosse	101,800	76,800	50,100	24,600	71,200
Eau Claire	93,300	116,600	133,700	79,200	125,400
Rhinelanders	25,300	19,400	10,800	17,800	20,700
Superior	37,200	39,600	48,300	86,900	69,100
Central Office	<u>116,100</u>	<u>132,200</u>	<u>148,800</u>	<u>154,900</u>	<u>262,700</u>
Total	\$698,600	\$697,400	\$625,900	\$674,400	\$1,010,200

Each of the Department's eight districts has from one to three staff who are primarily responsible for conducting bridge inspections. However, none of these individuals inspects bridges on a full-time basis. District bridge inspectors typically are also responsible for:

- preparing planning documents for bridge rehabilitation projects;
- preparing budgets for and overseeing bridge maintenance work completed by counties;
- providing local governments with assistance in conducting inspections of local bridges; and
- providing structural engineering services and expertise to other administrative units within the district offices.

The number of FTE staff positions inspecting bridges increased from 10.48 in FY 1999-2000 to 12.99 in FY 2000-01, or by 24.0 percent.

As shown in Table 6, 12.99 FTE staff positions were used to inspect bridges in FY 2000-01, based on the Department's time-reporting records. This includes 9.18 FTE staff positions in the eight district offices and 3.81 FTE staff positions in the Department's central office. Although districts began completing routine inspections once every two years, rather than annually, in January 2000, a decline in hours reported for inspecting bridges did not occur. Central office officials explained that inspectors were supposed to use the change to a two-year inspection cycle to examine bridges more thoroughly. However, it was not possible for us to determine from the available data whether more thorough inspections are occurring.

Table 6

Reported Bridge Inspection FTE Staff Positions, by District

<u>District</u>	<u>FY 1996-97</u>	<u>FY 1997-98</u>	<u>FY 1998-99</u>	<u>FY 1999-2000</u>	<u>FY 2000-01</u>
Madison	1.75	1.52	1.01	1.16	1.42
Waukesha	0.87	1.09	0.73	1.23	1.10
Green Bay	1.31	0.99	0.53	1.09	1.55
Wisconsin Rapids	1.47	1.31	1.02	0.98	1.58
La Crosse	1.63	1.18	0.79	0.34	0.79
Eau Claire	1.42	1.76	1.92	1.13	1.51
Rhineland	0.36	0.25	0.12	0.24	0.22
Superior	0.74	0.75	0.74	1.53	1.01
Central Office	<u>2.21</u>	<u>2.44</u>	<u>2.64</u>	<u>2.78</u>	<u>3.81</u>
Total	11.76	11.29	9.50	10.48	12.99

We attempted to determine whether comparable levels of staff time are reported for inspection activities among the districts, but several factors prevented this analysis. For example, although central office staff—who accounted for almost one-third of total inspection hours in FY 2000-01—perform inspections in the districts, they do not assign their time to districts in which this work is performed. In addition, the Department’s data do not contain sufficient detail to allow the types of inspections on which district staff’s hours were spent—such as routine or in-depth inspections—to be determined. Districts also have unique combinations of different types of bridges, some of which require less time and effort to inspect than others.

State Staff Qualifications

Federal and state regulations require that a bridge inspector must:

- be a registered professional engineer, or be qualified for registration under state law;
- have at least five years of experience inspecting bridges and have completed a comprehensive training course; or
- be certified by the National Institute for Certification in Engineering Technologies, a national nonprofit organization.

The Department adheres to these regulations and requires all state staff, including professional engineers, to take a two-week comprehensive bridge inspection training course. Staff who assist inspectors do not need to have these professional qualifications. For example, the Department hires college students as limited-term employees during the summer to assist with bridge inspections and other maintenance-related activities. These individuals must be supervised by a staff member who has the requisite qualifications.

All state staff with bridge inspection responsibilities have the required qualifications.

All current state staff with responsibility for inspecting bridges possess the minimum professional qualifications required by federal and state regulations. Approximately half of the state staff are registered professional engineers, and the rest have taken the two-week bridge inspection course and have the necessary five years of experience.

Expenditures for Consultant-Staffed Inspections

The Department does not adequately monitor consultant expenditures for bridge inspections.

Federal law permits the use of private bridge consultants to conduct inspections, but the Department remains responsible for ensuring that consultant-led inspections are conducted in accordance with federal regulations and national inspection guidelines. Expenditures for bridge inspection consultants make up a significant portion of total program expenditures. However, the Department has not established criteria to determine when to hire a consultant for bridge inspecting, does not monitor statewide consultant expenditures, and does not analyze the cost-effectiveness of using consultants instead of state staff to perform routine inspections in the Waukesha district.

Private-sector consultants perform routine inspections on bridges in Milwaukee County.

The Department's central office provides each district with an annual consultant budget that is based on the estimated cost of the necessary work that state staff are unable to complete. The budget includes the estimated cost of hiring all types of consultants, including design, construction management, and bridge inspection consultants. Districts typically hire bridge inspection consultants when they require specialized expertise; alternatively, the central office may contract with firms on the districts' behalf. For example, consultants conduct some underwater inspections and inspections of bridges with complex or unusual features. Unlike other districts, the Waukesha district hires consultants to perform a portion of its routine inspections. Consultants perform routine inspections on bridges in Milwaukee County, which make up about half of the district's bridges, while district staff complete the routine inspections of bridges in the district's other counties.

There are advantages to hiring bridge inspection consultants. As noted, state staff may not possess the specialized expertise needed to inspect certain bridges, or they may be unable to complete all inspections as frequently as required by law. Consultants may provide a fresh perspective on a bridge's condition. In addition, having consultants inspect some bridges allows state staff to complete other duties, such as planning future bridge maintenance projects and ensuring that bridge maintenance work is completed. However, Federal Highway Administration officials noted that using consultants to perform routine inspections is generally not preferred because state staff, who are ultimately responsible for all bridges, may not develop detailed knowledge about the condition of bridges that are inspected by consultants.

Officials in the Department indicated that they would prefer not to hire consultants to conduct any routine inspections, but they believe there are too few state staff in the Waukesha district to both inspect all bridges as frequently as required by law and complete other planning and engineering duties. Illinois, Indiana, Iowa, Minnesota, and Ohio do not hire consultants to conduct routine inspections, but Michigan sometimes hires them. Among these six midwestern states, only Minnesota does not hire any consultants, even for specialized inspections.

In Wisconsin, once the decision has been made to contract for bridge inspection services, consultants indicate their interest in working for the Department by submitting their qualifications. Consultant inspectors must meet the same qualifications that are required for district staff. Project managers interview firms and rank them according to their ability to provide quality services, including the skill level and expertise of the personnel who will work on the project and the firms' past records of producing quality work for reasonable prices. After a firm has been selected by the district and approved by the central office, district staff negotiate payment amounts.

Since FY 1996-97, consultant costs have been 53.5 percent of total inspection program expenditures.

Because the Department does not monitor consultant costs, officials were unable to provide precise expenditures, but they provided the best available information. As shown in Table 7, the Department’s estimated expenditures for consultants varied considerably during the past five fiscal years, ranging from a low of \$510,900 in FY 1998-99 (paid to six firms) to a high of \$1.2 million in FY 2000-01 (paid to eight firms). Consultant expenditures represented 53.5 percent of total bridge inspection program expenditures during the past five fiscal years, although the amount spent to hire consultants to conduct routine inspections is unknown. Staff in the Department attribute a portion of the increase in expenditures by the central office in FY 2000-01 to the Hoan Bridge failure. Four districts—Madison, La Crosse, Rhinelander, and Superior—had no consultant costs during the five-year period.

Table 7

Estimated Bridge Inspection Consultant Expenditures, by District

<u>District</u>	<u>FY 1996-97</u>	<u>FY 1997-98</u>	<u>FY 1998-99</u>	<u>FY 1999-2000</u>	<u>FY 2000-01</u>
Waukesha	\$1,037,200	\$346,800	\$397,400	\$562,200	\$ 424,300
Green Bay	0	0	3,400	0	0
Wisconsin Rapids	0	6,200	52,500	11,500	7,800
Eau Claire	0	32,100	3,200	0	0
Central Office	<u>24,500</u>	<u>483,400</u>	<u>54,400</u>	<u>28,000</u>	<u>786,600</u>
Total	\$1,061,700	\$868,500	\$510,900	\$601,700	\$1,218,700

The Department uses performance measures to monitor other types of consultants it hires, such as those that provide design and construction engineering services. These measures allow program managers to compare the cost and quality of consultants’ work with that of state staff who perform similar duties. The Department does not, however, compare the costs of using district staff with the costs of using bridge inspection consultants.

Without such information the Department cannot know with certainty whether it uses consultants in a cost-effective manner, especially when consultants conduct routine bridge inspections. Therefore, we recommend the Department of Transportation:

- collect information on bridge inspection costs incurred by state staff, including costs associated with inspection equipment, traffic control, and travel;
- collect information on bridge inspection consultant costs; and
- compare state staff and consultant bridge inspection costs in order to determine whether it is cost-effective to hire consultants to complete routine bridge inspections.

Consultant Evaluations

The decision to hire a consultant bridge inspector should be based on a firm's ability to provide quality work. Departmental policies require project managers to complete evaluations of consultants at the conclusion of every contract, and they also permit the completion of interim evaluations at the discretion of project managers. Evaluations identify the strengths and weaknesses of a consulting firm's work, allow the Department to provide constructive feedback that can help a firm improve its future performance, and help staff select qualified firms for future projects. We found, however, that evaluations have often not been completed in a timely manner, or at all, in recent years.

The Department's evaluation form rates consultants in five areas: project management, human relations, engineering skills, quality of work, and timeliness. A project manager may also provide written comments about a firm's performance. The form has not changed since 1997, when the Audit Bureau released a report that found the Department had completed only about half of the required performance evaluations for consultants that were hired to design road and bridge projects (report 97-4).

From March 1996 through April 2000, the Department's data show that work was completed on 25 bridge inspection consultant contracts, including:

- 14 contracts managed by the Waukesha district;
- 5 contracts managed by the central office;
- 3 contracts managed by the Green Bay district;
- 2 contracts managed by the Eau Claire district; and
- 1 contract managed by the Wisconsin Rapids district.

State staff completed evaluations after only 6 of 25 bridge consultant contracts.

The Department's electronic data, maintained at the central office, show that evaluations were completed for 6 of the 25 contracts, or fewer than one-fourth of the contracts. Waukesha district staff completed all six evaluations. Although the Department's policies require evaluations to be completed in a timely manner after a contract's completion, the six evaluations were completed, on average, 415.3 days after the contracts ended. However, the time varied considerably and included:

- 22 days for one evaluation;
- 298 days for three evaluations;
- 717 days for one evaluation; and
- 859 days for one evaluation.

Departmental policies require project managers to submit the completed evaluations to the central office within three months after a contract's completion. The Department's data include the dates on which the central office received two of the six evaluations. The central office received one evaluation 887 days after the project was completed and the other 1,594 days after the project was completed.

Central office officials suggested that evaluations are not always completed because project managers believe the evaluation form contains too few criteria to evaluate a consultant effectively and fairly. Officials also noted that consultants are often retained through contracts under which firms provide inspection services for many bridges during the contract period. These contracts may be in effect for up to two years, making it difficult for project managers to remember the consultants' performance early in the contract period. Finally, officials noted the decentralized nature of the Department's districts, which sometimes results in district staff not adhering to the policies on completing evaluations.

Project managers may be unaware of a consultant's prior work performance without access to complete and timely evaluations, which are particularly important given that consultants are hired through a quality-based selection process. In addition, consultants are less likely to improve their performance without feedback. The Department is considering ways to modify the evaluation form in order to make it more useful, such as adding additional evaluative criteria. However, program officials need to ensure that project managers in both the central office and the districts consistently complete evaluations in a timely manner. Officials may also want to consider encouraging project managers to complete interim evaluations during lengthy bridge inspection contracts.

The Department's written bridge inspection procedures are generally consistent with the regulations and guidelines promulgated by the Federal Highway Administration and the American Association of State Highway Transportation Officials, and Federal Highway Administration officials we spoke with are satisfied with the Department's inspection efforts. However, we noted several concerns with the Department's oversight of the bridge inspection program: in recent years, some bridges have not been inspected as frequently as required by law; traffic count information in the bridge inspection database is outdated; and the Department does not maintain all federally required lists of bridges. We also identified concerns with the Department's oversight of routine bridge maintenance work.

Frequency of Routine Inspections

Before August 1999, state administrative code required annual inspections of each state bridge.

Federal regulations require the Department to inspect each bridge at regular intervals not to exceed two years. However, the Department inspected bridges more frequently until recently because s. TRANS 212.06 (1), Wis. Adm. Code, required annual inspections of all state bridges. Administrative code was changed in August 1999 to require that state bridges be inspected at regular intervals not to exceed two years, which is common in other midwestern states, and the Department implemented this change beginning in January 2000.

The Department initiated the change in administrative code in order to match the federally required routine bridge inspection interval, which most officials believe is sufficient to detect structural problems. In addition, officials stated the change allows inspectors more time to:

- inspect bridges thoroughly, and to more frequently inspect those bridges with deteriorating conditions;
- identify bridge maintenance concerns and coordinate maintenance activities with the county highway department staff who complete the work; and
- be involved in planning future bridge rehabilitation projects.

Bridge inspectors in five other midwestern states—Illinois, Indiana, Iowa, Michigan, and Minnesota—typically conduct routine inspections every 24 months. However, Ohio uses a 12-month inspection interval, and some bridges in Illinois are inspected once every four years.

From 1996 through 1999, 53.4 percent of inspections were not completed within the required 12-month interval.

We reviewed the Department’s bridge inspection data to determine whether the Department had inspected all state bridges annually from 1996 through 1999, before the change in state administrative code. As shown in Table 8, 46.6 percent of inspections conducted during that period were completed within the required 12-month interval, while 53.4 percent were not. The percentage of inspections that were conducted within the required interval ranged from a low of 26.4 percent in the Waukesha district to a high of 55.7 percent in the La Crosse district. During the four-year period, 186 inspections, or 1.5 percent of the total, occurred more than 24 months after a prior inspection, thereby exceeding the federally required inspection interval.

Table 8

Inspection Frequency of State Bridges, by District
1996 through 1999

<u>District</u>	<u>12.0 Months or Less</u>	<u>12.1 to 18.0 Months</u>	<u>18.1 to 24.0 Months</u>	<u>More than 24.0 Months</u>
Madison	53.9%	42.2%	3.7%	0.2%
Waukesha	26.4	42.6	26.4	4.6
Green Bay	49.2	45.7	4.6	0.5
Wisconsin Rapids	54.9	40.5	4.5	0.1
La Crosse	55.7	37.8	6.4	0.1
Eau Claire	50.0	49.5	0.5	0.0
Rhineland	47.4	49.1	2.7	0.8
Superior	48.0	37.3	8.8	5.9
Overall	46.6	43.0	8.9	1.5

Officials in the Department provided several reasons why most routine inspections were not completed within 12-month intervals. While acknowledging that some inspections were missed, they explained that:

- district bridge inspectors interpreted administrative code to mean that they needed to inspect each bridge once every calendar year, not once every 12 months;
- some inspectors assumed that bridges inspected in 1998 did not need to be inspected again until 2000 because of the anticipated change in administrative code;
- inspections were completed when specialized equipment was available to districts, inspectors' travel time could be optimized, and bridge and surrounding roadway construction projects were completed, even if this meant that the 12-month interval was exceeded; and
- some bridges along borders were inspected by neighboring states' transportation agencies, but the results may not have been reported to the Department.

From January 2000 through August 2001, 15.9 percent of state bridges were not inspected as frequently as required by law.

We also reviewed the data for inspections completed from January 2000 through August 2001, to determine whether state bridges were inspected within 24 months of a prior inspection, as required by the administrative code change. As shown in Table 9, overall, 84.1 percent of inspections occurred within the required 24-month interval. However, 15.6 percent of inspections statewide required up to 36 months to complete, and 0.3 percent required more than 36 months. Experience varied among the districts. For example, 84.3 percent or more inspections in the Waukesha, Eau Claire, Rhinelander, and Superior districts were completed in the required interval, compared to only 47.6 percent of inspections in the Wisconsin Rapids district.

Table 9

Inspection Frequency of State Bridges, by District
January 2000 through August 2001

<u>District</u>	<u>24.0 Months or Less</u>	<u>24.1 to 36.0 Months</u>	<u>More than 36.0 Months</u>
Madison	79.6%	20.1%	0.3%
Waukesha	96.9	3.1	0.0
Green Bay	74.7	24.7	0.6
Wisconsin Rapids	47.6	52.4	0.0
La Crosse	72.7	26.7	0.6
Eau Claire	96.6	3.4	0.0
Rhineland	84.3	14.5	1.2
Superior	84.3	15.2	0.5
Overall	84.1	15.6	0.3

The Department's completion of routine inspections within the federally required 24-month interval has not improved since the administrative code change, despite the fact that more staff time is being spent on the inspections. In fact, the percentage of inspections that were not completed on a timely basis has increased. From January 2000 through August 2001, 15.9 percent of all inspections were not completed within the federally required time interval. In contrast, only 1.5 percent of all inspections were not completed within the federally required time interval from 1996 through 1999. We could not, however, determine from the available data whether the difference between these periods occurred because routine inspections have become more rigorous, more time is being spent conducting in-depth inspections and examining bridges with structural deficiencies, or staff are becoming less efficient.

Inspecting bridges that have deteriorated or developed structural problems is particularly important. Departmental policies and industry guidelines do not presume a reduction in routine inspections when specialized inspections are being conducted in response to structural problems. Therefore, we analyzed the inspection histories of the 420 state bridges that were categorized as structurally deficient in 2000. Some of these bridges have been replaced by newer bridges and are no longer in the Department's inspection database. Therefore, we examined the inspection histories of the 393 bridges that remain in the database, some of which were inspected more than once from January 2000 through August 2001.

Inspections of 32 structurally deficient bridges were not completed within the required 24 months.

As shown in Table 10, from January 2000 through August 2001, 368 inspections of structurally deficient bridges, or 92.0 percent of the total, were completed within the required 24-month interval. However, 32 inspections, or 8.0 percent of the total, were completed more than 24 months after a prior inspection.

Table 10

Inspection Frequency of Structurally Deficient State Bridges, by District
January 2000 through August 2001

<u>District</u>	<u>24.0 Months or Less</u>	<u>24.1 to 36.0 Months</u>
Madison	37	8
Waukesha	169	0
Green Bay	33	2
Wisconsin Rapids	8	1
La Crosse	31	15
Eau Claire	71	1
Rhineland	3	0
Superior	<u>16</u>	<u>5</u>
Total	368	32

The central office does not provide districts with guidelines for scheduling inspections or require them to submit schedules demonstrating how they intend to complete all inspections within the prescribed interval. Instead, responsibility for scheduling inspections is left to the professional discretion of district bridge inspectors. Some

districts, for example, planned to inspect bridges in half of their counties in 2000 and in the other half during 2001, while others reported inspecting bridges on all north/south roads in one year and all east/west roads in the following year.

In the past, central office officials provided each district with an annual list of bridges that had not been inspected as required, with the understanding that districts would complete the missed inspections as soon as possible. However, this practice was discontinued about two years ago because districts' access to the Department's centralized bridge inspection database increased, and the districts were able to determine for themselves whether they had inspected all bridges as frequently as required by law. As a result, the central office stopped monitoring whether districts are completing inspections as frequently as required.

The Department should ensure routine bridge inspections are completed in a timely manner.

To improve the Department's procedures for ensuring and monitoring the appropriate completion of routine bridge inspections, we recommend:

- the Department of Transportation's eight districts each provide the central office with semiannual reports that explain how they will complete all bridge inspections within the required 24-month interval; and
- the central office provide each of the eight districts with semiannual reports listing the bridges that were inspected during the prior six months and the bridges that state and federal law require to be inspected during the upcoming six months.

Routine Bridge Maintenance

While examining bridges, inspectors identify needed routine bridge maintenance work, which is typically completed by county highway departments under contract with the Department. Timely routine maintenance work does not improve a bridge's structural integrity and condition, but it postpones the need for more costly rehabilitation projects and is important for achieving the potential 75-year life span of a bridge. Available information suggests the Department has not allocated sufficient funding to complete all identified routine bridge maintenance work. In addition, we noted concerns with the districts' oversight of both the process by which bridge maintenance work is completed and the county reimbursement process.

Maintenance Expenditures

The Department does not have a detailed accounting of routine bridge maintenance costs.

The Department has monitored state staff salaries and fringe benefits associated with bridge maintenance activities since March 1999. These costs, which are in addition to the inspection expenditures that were shown in Table 4, include the time bridge inspectors and others report for activities such as identifying maintenance needs, ensuring county highway departments complete the work, and planning future maintenance activities. As with bridge inspection activities, the Department does not have a detailed accounting of equipment, traffic control, and travel costs associated with routine bridge maintenance work.

As shown in Table 11, estimated state staff expenditures for bridge maintenance activities increased from \$568,600 in FY 1999-2000 to \$723,300 in FY 2000-01, or by 27.2 percent. Part of this increase resulted from the salary increases provided to the Department's bridge inspectors in FY 2000-01.

Table 11

Estimated Expenditures for the State-Staffed Bridge Maintenance Program, by District*

<u>District</u>	<u>FY 1999-2000</u>	<u>FY 2000-01</u>
Madison	\$ 23,000	\$ 54,000
Waukesha	149,500	195,700
Green Bay	63,600	93,700
Wisconsin Rapids	102,500	126,200
La Crosse	44,000	54,600
Eau Claire	68,700	63,100
Rhineland	64,900	67,800
Superior	<u>52,400</u>	<u>68,200</u>
Total	\$568,600	\$723,300

* Includes estimated amounts incurred for salaries as well as bridge maintenance equipment, traffic control, and travel.

The Department's central office provides districts with annual budgets for all maintenance projects to be completed in each county, and the districts allocate this funding to various needs, including roadway maintenance, roadside maintenance, and routine bridge maintenance. As shown in Table 12, expenditures for routine bridge maintenance projects completed by county highway departments increased from approximately \$4.0 million in 1996 to approximately \$4.7 million in 2000, or by 17.5 percent. Appendix 2 shows bridge maintenance expenditures in each county.

Table 12

**Expenditures for Routine Bridge Maintenance Performed by Counties,
by District**

<u>District</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
Madison	\$ 908,597	\$ 798,675	\$ 945,463	\$ 942,049	\$ 846,755
Waukesha	777,558	890,815	1,129,341	1,039,857	973,929
Green Bay	1,325,860	1,236,898	1,238,714	1,295,485	1,478,819
Wisconsin Rapids	291,889	278,679	385,073	342,859	466,133
La Crosse	194,744	218,539	244,623	202,484	222,488
Eau Claire	225,599	265,866	314,981	297,278	334,257
Rhineland	157,102	173,509	148,171	98,117	165,897
Superior	<u>70,661</u>	<u>90,940</u>	<u>150,897</u>	<u>131,433</u>	<u>184,439</u>
Total	\$3,952,010	\$3,953,921	\$4,557,263	\$4,349,562	\$4,672,717

The Department believes there is insufficient funding to address all bridge maintenance needs.

Officials in the Department and the Federal Highway Administration believe the Department has sufficient funding to address the highest-priority bridge maintenance needs, but some lower-priority projects might not always be completed. Bridge inspectors in five districts noted they do not always have sufficient funds to address all routine bridge maintenance needs. For example, in 2000, routine maintenance work on one non-interstate bridge cost one district more than \$20,300, or approximately two-thirds of the district's entire \$30,000 budget for all 48 non-interstate bridges in a county. District and central office staff emphasized, however, that the safety of bridges is not necessarily jeopardized if routine maintenance work is not performed.

The Department's ability to complete routine bridge maintenance work was further constrained by a funding shortfall that developed in spring 2001. A harsh winter, with above-average snowfall, resulted in considerable amounts of overtime for county snow removal crews and the need for additional road salt purchases. These unexpected costs depleted road maintenance funds and required the Department to conserve all remaining FY 2000-01 maintenance funds, including those budgeted for routine bridge maintenance work. As a result, central office officials told district bridge inspectors in April 2001 not to initiate any additional routine bridge maintenance projects that would be paid for in FY 2000-01. On May 9, 2001, the Joint Committee on Finance increased funding for road maintenance by \$8.5 million, and bridge inspectors were again allowed to initiate bridge maintenance projects.

District Oversight of Maintenance Work

Based on the results of their inspections, inspectors provide county highway departments with work orders that list all routine bridge maintenance work that should be completed on state bridges in each county. Inspectors also provide their estimates of the cost of the work. After county highway departments complete the requested maintenance work, they submit invoices to the districts, which then reimburse the counties.

Bridge inspectors in five districts stated that some counties do not complete bridge maintenance work in a timely manner. Comprehensive information indicating how frequently this occurs does not exist. Inspectors, as well as the Wisconsin County Highway Association, believe that some counties lack the necessary workers and resources. In addition, we were told that some counties solicit additional work from towns and cities to ensure full employment for county staff, hindering their ability to complete work on state bridges.

Only two districts routinely verify that bridge maintenance work has been completed.

Although inspectors are aware that some counties do not complete routine maintenance work in a timely manner, only the Madison and Rhinelander districts have implemented procedures to verify that work has been completed. Inspectors in these two districts reported revisiting all bridges on which counties were requested to perform maintenance work. Inspectors in four other districts reported using site visits to spot check the completion of maintenance work, but they do not consistently verify the completion of all such work. Central office staff do not verify that routine bridge maintenance work is completed.

A 1999 quality-assurance review of the Waukesha district conducted by the Federal Highway Administration and the Department's central office confirmed that some counties in the district did not complete routine maintenance work in a timely manner. In addition, a 2000 quality-assurance review noted that the Superior district did not have documentation verifying that routine maintenance work had been completed. Federal Highway Administration officials identified the lack of follow-up on maintenance work within some districts as a weakness of the program.

The Department does not adequately monitor counties' routine bridge maintenance expenditures.

In addition to lacking procedures for verifying the completion of routine maintenance work, districts are generally unable to monitor counties' routine bridge maintenance expenditures. Although invoices submitted by counties contain all of the reporting information required by the Department, they do not always contain sufficient information to determine the bridges on which the work was completed or the type of work that was completed. While some districts have asked counties to report itemized cost information for specific routine maintenance work on each bridge, only the Madison district uses this information to verify that the billing information is accurate. Given that counties do not always perform the routine maintenance work requested of them and that most districts do not verify the completion of all routine maintenance work, the potential exists for counties to overcharge the Department or to bill for work that has not been completed.

With the change to a 24-month inspection cycle, bridge inspectors may not notice for two or more years that bridge maintenance work has not been completed. Therefore, the Department may wish to develop procedures for the districts to use in monitoring and documenting the completion of routine bridge maintenance work, including identification of the bridges where work was completed and the cost of the work completed on each bridge. This process could also include determining in which situations bridge inspectors are expected to use site visits to verify that counties are completing routine maintenance work as requested. In addition, the Department could provide the districts with assistance to ensure they are not overcharged for routine bridge maintenance work.

Other Inspection Issues

In addition to the Department not completing routine inspections as often as required by state law or consistently overseeing the completion of routine bridge maintenance work, we noted other concerns with the bridge inspection program. While none of these concerns affect the safety or quality of state bridges, effective management of the bridge inspection program requires that the Department follow applicable laws, policies, and national bridge inspection guidelines.

Average Daily Traffic Counts

Each routine inspection report includes the bridge's sufficiency rating, which provides an overall measure of the bridge's condition and is used to determine eligibility for federal funds. The sufficiency rating is a number from 0 to 100, with 100 indicating a bridge in perfect condition. A bridge in need of repair becomes eligible for federal bridge replacement and rehabilitation funding if: 1) certain features of the bridge have deteriorated beyond established standards; 2) the bridge has not received federal funding within the past ten years; and 3) the bridge's sufficiency rating is lower than 80, making it eligible for rehabilitation funds, or lower than 50, making it eligible for replacement funds. The Department received \$27.2 million from the federal bridge program in federal fiscal year 2000-01.

The sufficiency rating is determined by a number of factors, including the bridge's adequacy and safety; the number of traffic lanes on the bridge; the width of the roadway on the bridge; and the number of vehicles that pass over the bridge each day, which is known as the average daily traffic count. Although sufficiency ratings tend to decline as the average daily traffic count increases, other factors may influence the sufficiency rating more than the average daily traffic count. Federal Highway Administration guidelines suggest that an average daily traffic count should be updated once every three years, and the Department adheres to these guidelines. Its staff count vehicular traffic over thousands of road segments, updating the counts in one-third of all counties each year.

Current average daily traffic counts are maintained in a database that is not electronically linked to the Department's bridge inspection database. Average daily traffic counts in the bridge inspection database are typically updated only when a new bridge is constructed or significant bridge reconstruction work is completed. As of July 2001, average daily traffic counts included in the bridge inspection database for 3,256 state bridges, or about two-thirds of all state bridges, had been calculated prior to 1998, or more than three years ago.

The Department should update average daily traffic counts in its bridge inspection database.

Average daily traffic counts on state-owned roads increased 8.4 percent from 1996 through 1999. Incorporating the most recent average daily traffic counts into the bridge inspection database could potentially give the Department access to additional federal funds to repair deteriorating bridges. As of July 2001, 429 bridges with average daily traffic counts taken before 1998 had sufficiency ratings between 80.0 and 84.9, and an additional 47 bridges with similarly outdated average daily traffic counts had sufficiency ratings between 50.0 and 54.9, which is only slightly higher than the levels needed to be eligible for federal funding if other funding criteria are also met. Average daily traffic counts for more than one-fourth of these bridges were taken from 1980 through 1991 and, therefore, are likely lower than current counts. *Therefore, we recommend the Department of Transportation include the most recent average daily traffic counts in the bridge inspection database and use them to determine state bridges' sufficiency ratings.*

Master Bridge Lists

Federal regulations require the Department to maintain master lists of all bridges in the state that have:

- fracture critical components, which are particular components of a bridge whose failure would be expected to cause the bridge to collapse;
- underwater components that cannot be visually inspected from above the surface of the water; and
- unique or special bridge features that require additional attention during inspections.

These master bridge lists are required to include the date of the last inspection for each bridge, a description of the findings from each bridge's last inspection, and any follow-up actions that are needed.

Although the central office maintains master lists of bridges with fracture critical components and unique or special features, it does not maintain a master list of bridges with underwater components. Instead, the central office relies on bridge inspectors to maintain lists of bridges with underwater components in their individual districts.

The Department should maintain a master list of bridges that require underwater inspections.

The absence of a single statewide master list prevents central office staff from knowing whether all bridges with underwater components are being inspected every five years, as required by federal regulations. In addition, if the individual districts do not have effective record-keeping systems for bridges that require underwater inspections, the possibility increases that bridges will not be inspected appropriately, especially if a district inspector retires or transfers to another position. Accordingly, we recommend the Department of Transportation maintain the federally required master list of all bridges in the state that require underwater inspections, including information about the date of the last underwater inspection, a description of the inspection's findings, and any needed follow-up actions.

The Hoan Bridge in Milwaukee failed in December 2000.

The two-mile Daniel Webster Hoan Bridge, which opened to traffic in 1977, is part of Interstate 794 in the City of Milwaukee. Inspectors have identified numerous structural problems with the bridge for many years. On December 13, 2000, cracks developed in the girders of one section, causing the bridge to fail and the roadway to drop four feet. Although national bridge experts determined that the Department's inspections could not have foreseen the Hoan Bridge's failure, we noted several concerns with the bridge's inspection history.

Hoan Bridge Failure

Inspection reports completed from 1992 through 2000 indicate that the Hoan Bridge has a history of structural problems, including joints with defective welds, cracks in the steel girders, and deterioration of the concrete bridge deck. In 1992, the Department resurfaced the bridge deck to try to prevent water from seeping into the concrete and causing further deterioration. The Department also installed plastic netting on the underside of the bridge deck in selected areas to catch falling pieces of deteriorated concrete.

Six months before the bridge's failure, inspectors found two large cracks that were 21 and 36 inches long in two steel girders of the Hoan Bridge. These two cracks did not contribute to the bridge's subsequent failure, although the 36-inch crack was in one of the girders that failed. After the cracks were found, the Department tried to determine the cause of the cracks and hired consultants to perform additional tests and develop a plan for retrofitting the bridge. Those tests were scheduled to begin in mid-December but had not begun when the bridge failed.

On December 13, 2000, three 10-foot high steel girders south of the Hoan Bridge's main arch cracked, which almost resulted in the bridge section's collapse. As a result of the failure, the bridge was immediately closed to traffic. Demolition experts hired by the Department used explosives to remove the failed section of the bridge on December 28, 2000.

National experts concluded that inspections could not have predicted the Hoan Bridge's failure.

National bridge experts and Federal Highway Administration officials examined the Hoan Bridge and determined the cracks in the steel girders that caused the bridge's failure developed so suddenly and unexpectedly that they could not have been detected by the Department. They noted that this is the first known instance of cracks of this type developing without prior evidence of fatigue in the area of the cracks. In a June 2001 report prepared for the Department, the national bridge experts concluded that:

- the particular structural configuration of the Hoan Bridge—which incorporated design practices that were acceptable when the bridge was built but are no longer used in constructing bridges—contributed to the rapid development of the cracks in the steel girders;
- the steel used in the bridge's construction was sufficiently strong to stop the propagation of cracks under normal conditions, but sub-zero temperatures in December 2000 reduced the steel's ability to stop the rapid formation of cracks; and
- the two large cracks that were discovered during the summer 2000 inspection were similar to the cracks that caused the bridge's failure, but the two cracks were believed to have originated in warmer temperatures, which prevented them from developing further.

As shown in Table 13, Hoan Bridge repair and retrofit costs are estimated to total \$15.8 million, including the costs associated with the initial emergency work and the repair and retrofit of the bridge, but excluding inspection-related costs. In May 2001, the Department awarded a \$7.5 million contract for replacing and retrofitting the Hoan Bridge, including the demolished span. The retrofit incorporates modern bridge design practices that are expected to improve the structural configuration.

Table 13

Estimated Hoan Bridge Repair Costs
 As of September 2001
 (in millions)

	<u>Amount</u>
Bridge span replacement and retrofit	\$ 7.5
Demolition and clean-up	2.8
Milwaukee Metropolitan Sewerage District damage mitigation	2.0
Evaluation of repair alternatives	1.4
Construction and engineering contingencies	0.9
Change order and contract revisions	0.7
Preliminary engineering and bridge stabilization costs	0.2
Final design costs	0.2
Traffic mitigation	<u>0.1</u>
Total	\$15.8

The \$15.8 million cost includes funds for the Milwaukee Metropolitan Sewerage District (MMSD) to pay for damages, mitigation costs, and service interruptions at its Jones Island treatment facility, which is near the Hoan Bridge. As of July 31, 2001, the Department had paid \$1.2 million to MMSD, and MMSD officials expect total costs will not exceed \$2.0 million. The majority of the funds provided were used to establish a mobile operations unit at the Jones Island plant in case MMSD's main operations unit was severely damaged during the demolition of the bridge section. The Department also plans to reimburse MMSD for increased permit fees levied by the Department of Natural Resources because treated water released into Lake Michigan after the demolition exceeded acceptable contamination levels. Operations at the plant were interrupted the day of the demolition, and water was released into Lake Michigan before the treatment process could be completed. MMSD officials explained that the release was necessary to maintain the proper flow in the treatment ponds during cold weather and because the storage capacity in the system's deep tunnel reservoir is limited.

Federal funds may pay for most of the estimated \$15.8 million cost to repair the Hoan Bridge.

The Department has requested federal funds to pay for most of the costs associated with repairing the Hoan Bridge. The U.S. Senate earmarked \$15.0 million in federal discretionary bridge funds for the Hoan Bridge in its version of the federal transportation appropriation bill for federal fiscal year 2001-02, but the Department expects Congress to reduce the amount to \$12.8 million. States typically must provide a 50 percent match to receive these federal funds, but the U.S. Department of Transportation agreed to reduce Wisconsin's match to 20 percent. Thus, if Hoan Bridge repair costs total \$15.8 million, the Department will pay \$3.2 million, and it will spend \$12.6 million of the 12.8 million in available federal funds.

Inspection History

Since 1992, routine inspections of the Hoan Bridge have been performed by both state staff and private consultants. This is consistent with the practice of the Waukesha district to hire consultants to inspect bridges in Milwaukee County. Three sets of detailed inspections, which included fracture critical and in-depth inspections, were completed by consultants in 1986, from 1993 to 1994, and from 1999 to 2000. The inspections, however, were not always completed within the intervals prescribed by federal and state law or the Department's own policies.

Routine Inspections

As noted, before August 1999, state administrative code required the Department to inspect each state bridge annually, although the Department continued annual inspections until January 2000. For inspection purposes, the Hoan Bridge is divided into 40 bridge units, and a separate routine inspection report must be completed for each unit.

The Department did not inspect the Hoan Bridge as frequently as required by law.

We reviewed inspection records for the Hoan Bridge and found that the Department did not always complete routine inspections of all 40 bridge units at regular 12-month intervals before 2000, and that the intervals varied considerably from one year to the next. The Department inspected only 23 bridge units within the required 12-month interval in 1999. Routine inspections conducted in 1998 for all 40 bridge units occurred more than 24 months after prior routine inspections, thereby also exceeding the interval prescribed by federal law. While no inspections were completed in 1997, two sets of inspections were completed in 1996, and records show that no inspections were completed in 1995. Although two sets of inspections were documented for 1994, the Department was unable to provide 1993 inspection reports for 10 of the 40 bridge units.

Waukesha district staff who are responsible for inspecting the Hoan Bridge offered several reasons for not completing any routine inspections of the bridge in 1997, including that they:

- had too few staff to complete the inspections within the required interval;
- had insufficient funds to hire consultants to complete the inspections;
- continued to use both inspection procedures that were in place before 1996 and the new procedures, which added time to the inspection process and prevented them from completing inspections of all state bridges in the district; and
- anticipated that state administrative code would soon be changed to allow routine inspections to be completed every two years. As noted, this change did not actually occur until August 1999 and was not implemented until January 2000.

Waukesha district staff maintain that they did inspect all 40 units of the Hoan Bridge in 1995. They assert that the first set of 1996 inspections was actually conducted in 1995, even though the inspection reports are dated February 1996. However, inspectors have indicated that they typically take only a few days to conduct routine inspections, and they are expected to complete the reports within a week after the inspections.

Fracture Critical Inspections

Fracture critical inspections focus on components that could lead to a bridge's collapse.

In addition to the routine inspections, the Department also conducts more detailed inspections of bridges whose structural integrity depends upon certain critical features. As noted, fracture critical components are features such as girders whose failure would be expected to result in the collapse of the bridge. The Department's policy requires that fracture critical inspections be conducted at regular intervals not to exceed six years on local bridges with fracture critical components, but it does not address the inspection frequency of state bridges. Officials stated, however, that the Department tries to complete detailed inspections of state bridges with fracture critical components every six years.

The main arch of the Hoan Bridge consists of two bridge units that contain fracture critical components. The other 38 bridge units do not have fracture critical components. There have been three sets of detailed inspections of the Hoan Bridge since it opened, and these have included fracture critical inspections of the two bridge units having fracture

critical components. The Waukesha district decided to conduct in-depth inspections of the other 38 bridge units within the same six-year interval that is required for fracture critical inspections, although it was under no obligation to do so.

The Department has attempted to complete timely fracture critical inspections of the Hoan Bridge's two units. The inspections were completed in May 1994, and again in July 2000. District officials believe that completing the inspections a few months after the required interval was sufficient. We note, however, that in-depth inspections of 15 of the remaining 38 bridge units were not completed within 72 months of prior inspections.

Inspection of Bridges Similar to the Hoan Bridge

Shortly after the Hoan Bridge failed, the Department identified 21 bridges throughout the state with similar structural configurations, examined each of them, and concluded that they were structurally sound. Although cracks were discovered in two bridge units, they differed from those that caused the Hoan Bridge's failure. The 21 bridges include 139 bridge units, each of which is inspected as if it is a separate bridge. We examined the Department's bridge inspection database to determine whether these bridges had been inspected as frequently as required by law.

The Department has generally inspected the 21 bridges similar to the Hoan Bridge as frequently as required by law.

The Department inspected a number of the bridge units more than once from January 2000 through August 2001. Furthermore, as shown in Table 14, in recent years the Department has generally inspected the 21 bridges that are similar to the Hoan Bridge as frequently as required by law. The one inspection that exceeded the 24-month interval was in the La Crosse district, and it took place 56 months after a prior inspection. The Department conducted 196 inspections of the 139 bridge units that make up the 21 bridges similar to the Hoan Bridge.

Table 14

Inspection Frequency of 21 Bridges Similar to the Hoan Bridge*
January 2000 through August 2001

<u>District</u>	<u>12.0 Months or Less</u>	<u>12.1 to 18.0 Months</u>	<u>18.1 to 24.0 Months</u>	<u>More than 24.0 Months</u>
Madison	4	0	0	0
Waukesha	83	95	8	0
Green Bay	0	2	0	0
La Crosse	0	0	2	1
Eau Claire	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	88	97	10	1

* The 21 bridges include 139 bridge units that are inspected separately.

In July 2001, the Federal Highway Administration recommended several modifications to the procedures all states use to inspect bridges similar to the Hoan Bridge. Inspectors subsequently reviewed the design plans for the 21 bridges and concluded that 20 lack the specific design details that resulted in the Hoan Bridge's failure. However, inspectors noted that the Menomonee Valley Bridge, which is part of Interstate 94 directly south of the Marquette Interchange in the City of Milwaukee, has design details similar to the Hoan Bridge's. The Department subsequently hired a private-sector consultant to inspect the bridge using the new Federal Highway Administration procedures. The inspection confirmed the need to retrofit the bridge to eliminate the design details, and officials in the Department expect the retrofit to be completed before the end of the year.

Appendix 1

Structurally Deficient Bridges, by District and County
2000

<u>Madison District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>	<u>Green Bay District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>
Columbia	95	3	3.2%	Brown	244	17	7.0%
Dane	265	6	2.3	Calumet	11	0	0.0
Dodge	64	4	6.3	Door	11	4	36.4
Grant	59	2	3.4	Kewaunee	15	1	6.7
Green	28	0	0.0	Manitowoc	92	6	6.5
Iowa	42	4	9.5	Marinette	27	5	18.5
Jefferson	66	5	7.6	Menominee	3	1	33.3
Lafayette	30	8	26.7	Oconto	28	2	7.1
Rock	104	14	13.5	Outagamie	80	10	12.5
Sauk	<u>78</u>	<u>12</u>	15.4	Shawano	49	5	10.2
District Total	831	58	7.0%	Sheboygan	82	0	0.0
				Winnebago	<u>113</u>	<u>9</u>	8.0
				District Total	755	60	7.9%

<u>Waukesha District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>	<u>Wisconsin Rapids District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>
Fond du Lac	49	3	6.1%	Adams	7	0	0.0%
Kenosha	58	2	3.4	Green Lake	10	0	0.0
Milwaukee	600	114	19.0	Juneau	76	4	5.3
Ozaukee	50	0	0.0	Marathon	144	5	3.5
Racine	46	3	6.5	Marquette	34	1	2.9
Walworth	106	0	0.0	Portage	58	1	1.7
Washington	71	2	2.8	Waupaca	53	2	3.8
Waukesha	<u>162</u>	<u>0</u>	0.0	Waushara	21	0	0.0
District Total	1,142	124	10.9%	Wood	<u>49</u>	<u>5</u>	10.2
				District Total	452	18	4.0%

<u>La Crosse District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>	<u>Rhineland District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>
Buffalo	71	15	21.1%	Florence	8	0	0.0%
Crawford	64	7	10.9	Forest	11	3	27.3
Jackson	72	1	1.4	Iron	18	1	5.6
La Crosse	100	3	3.0	Langlade	12	1	8.3
Monroe	153	12	7.8	Lincoln	47	1	2.1
Richland	73	4	5.5	Oneida	14	0	0.0
Trempealeau	75	8	10.7	Price	21	0	0.0
Vernon	<u>72</u>	<u>11</u>	15.3	Vilas	<u>10</u>	<u>1</u>	10.0
District Total	680	61	9.0%	District Total	141	7	5.0%

<u>Eau Claire District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>	<u>Superior District</u>	<u>Number of Bridges</u>	<u>Number of Structurally Deficient Bridges</u>	<u>Percentage Structurally Deficient</u>
Chippewa	104	12	11.5%	Ashland	18	1	5.6%
Clark	43	5	11.6	Barron	65	3	4.6
Dunn	86	15	17.4	Bayfield	34	5	14.7
Eau Claire	92	4	4.3	Burnett	14	3	21.4
Pepin	16	1	6.3	Douglas	62	5	8.1
Pierce	57	5	8.8	Polk	13	3	23.1
St. Croix	90	20	22.2	Rusk	29	2	6.9
Taylor	<u>21</u>	<u>4</u>	19.0	Sawyer	19	2	10.5
District Total	509	66	13.0%	Washburn	<u>21</u>	<u>2</u>	9.5
				District Total	275	26	9.5%

Appendix 2

Bridge Maintenance Expenditures, by District and County
2000

<u>Madison District</u>	<u>Bridge Maintenance Expenditures</u>	<u>Green Bay District</u>	<u>Bridge Maintenance Expenditures</u>
Columbia	\$442,927	Brown	\$ 217,855
Dane	157,469	Calumet	0
Dodge	29,614	Door	432,451
Grant	30,325	Kewaunee	646
Green	6,705	Manitowoc	69,608
Iowa	46,954	Marinette	166,280
Jefferson	21,804	Menominee	0
Lafayette	15,137	Oconto	2,628
Rock	58,619	Outagamie	51,017
Sauk	<u>37,201</u>	Shawano	19,821
District Total	\$846,755	Sheboygan	36,603
		Winnebago	<u>481,910</u>
		District Total	\$1,478,819

<u>Waukesha District</u>	<u>Bridge Maintenance Expenditures</u>	<u>Wisconsin Rapids District</u>	<u>Bridge Maintenance Expenditures</u>
Fond du Lac	\$ 48,647	Adams	\$ 7,305
Kenosha	38,215	Green Lake	12,469
Milwaukee	578,814	Juneau	65,299
Ozaukee	56,229	Marathon	117,707
Racine	68,875	Marquette	80,350
Walworth	61,465	Portage	42,432
Washington	41,417	Waupaca	102,343
Waukesha	<u>80,267</u>	Waushara	22,195
District Total	\$973,929	Wood	<u>16,033</u>
		District Total	\$466,133

<u>La Crosse District</u>	<u>Bridge Maintenance Expenditures</u>
Buffalo	\$ 13,579
Crawford	23,908
Jackson	22,775
La Crosse	30,435
Monroe	43,724
Richland	19,677
Trempealeau	29,172
Vernon	<u>39,218</u>
District Total	\$222,488

<u>Rhineland District</u>	<u>Bridge Maintenance Expenditures</u>
Florence	\$ 7,702
Forest	12,426
Iron	21,056
Langlade	1,725
Lincoln	67,556
Oneida	9,458
Price	24,856
Vilas	<u>21,118</u>
District Total	\$165,897

<u>Eau Claire District</u>	
Chippewa	\$ 42,249
Clark	20,944
Dunn	56,125
Eau Claire	69,753
Pepin	6,752
Pierce	52,818
St. Croix	71,117
Taylor	<u>14,499</u>
District Total	\$334,257

<u>Superior District</u>	
Ashland	\$ 8,627
Barron	58,243
Bayfield	8,511
Burnett	34,538
Douglas	40,304
Polk	15,057
Rusk	15,296
Sawyer	3,127
Washburn	<u>736</u>
District Total	\$184,439



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October 18, 2001

Janice Mueller, State Auditor
Legislative Audit Bureau
22 E. Mifflin St., Suite. 500
Madison, WI 53703

Dear Ms. Mueller:

The Wisconsin Department of Transportation has been working with the Legislative Audit Bureau (LAB) since February of this year to explain our bridge inspection program. We appreciate the professionalism of your staff and their willingness to spend time with us throughout this audit to understand this complex program. In general, the Department accepts your recommendations. Following are several comments to help clarify and explain our program.

Structurally Deficient Bridges

The audit spends a fair amount of time discussing “structurally deficient” bridges. The reader could infer that “structurally deficient” bridges are unsafe to the traveling public. This is not the case. The Federal Highway Administration requires a bridge to be classified as either “structurally deficient” or “functionally obsolete” in order for that bridge to be eligible for federal bridge replacement funds. Depending on the conditions that cause the deficiency, the bridge may not require any action other than to monitor the condition or may require some maintenance activities such as patching potholes. If the condition is more serious, traffic restrictions such as posting for maximum loads or possible lane reductions may be required. If the bridge is truly unsafe, it would be immediately closed to traffic and repaired or replaced. As the audit indicates, there were only two bridges or portions of bridges on the Wisconsin State Trunk Highway system closed as of July 2001. The Department always takes immediate and appropriate action to protect the safety of the traveling public.

Bridge Inspection Interval

The audit interprets Trans 212 language prior to August of 1999 to say that bridges on the state system shall be inspected annually to mean at or less than 12-month intervals. The Department, since the writing of the Trans 212 language in the early 1980's, has interpreted the

word “annually” to recognize the state practice at that time, which was to inspect state bridges on a calendar year basis or more frequently than the federal requirement of at least once every two years. We do agree that there were a small percentage of inspections that were greater than the federal two-year or state one-year requirement between 1996 and 1999. Some bridges were border bridges whose inspection responsibility was the adjacent state and their inspection was not listed in our files. A few bridges were inherited as jurisdictional transfers from local units of government. Other bridges were about to be replaced or eliminated as part of a construction project so they were not inspected. At times, inspection equipment may have had to be rescheduled because of repairs to the equipment, therefore the bridges could not be inspected within the time planned. We did miss some bridges. The Department staff, however, are professionals with experience and know which bridges are experiencing rapid decline or have specific problems and always pay particular attention to assessing the conditions of those structures. The audit also notes a higher percentage of inspections in calendar 2000 and 2001 (to date) that are missing the federal two-year requirement. We are in the process of completing a major revision of our bridge inspection manual for Wisconsin and will make the two-year (24-month) maximum interval very clear.

The Department never stated or expected that the number of total hours of bridge inspection would necessarily decline by going from inspecting bridges annually to once every two years. We intend to spend more time on each inspection and perform inspections more often on the bridges that need more attention.

Extensive Data Collection Recommendation

The audit recommends that the Department collect extensive information on bridge inspection costs incurred by state staff and consultants for every bridge, including costs associated with inspection equipment, traffic control (often performed by county forces) and travel and then compare the two to determine if it is cost effective to hire consultants for routine bridge inspections. Considering the present accounting systems do not allow for a separate “per bridge” accumulation of non-salary expenses, and the unlikelihood that Department resources will increase, we question the value of this intensive data gathering effort. We need data to compare costs to negotiate a fair price for consultant services, but the cost of creating and managing a new data system would be prohibitive.

Routine Maintenance Work

The audit suggests that the Department has not allocated sufficient funding to complete all identified routine bridge maintenance work. The Department prioritizes work and does not have the funds to do everything identified as a need. There certainly are routine maintenance items that should be done for specific bridges to lengthen serviceable life, but by not doing them we are not jeopardizing the safety of the traveling public.

Hoan Bridge and Bridges Similar to the Hoan

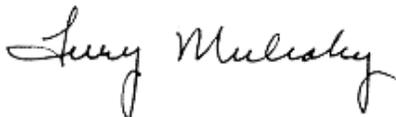
Following receipt of the federal Hoan Bridge failure analysis report, the Department reviewed the design plans for 21 bridges thought to be similar to the Hoan Bridge. We found one bridge with welded connection details similar enough to be of concern. These exist on several ramps on bridges at the north end of the Menomonee Valley Bridge in Milwaukee leading into the Marquette Interchange. We have completed detailed inspections of those units and like conditions do exist. The amount of contract work required is being determined at this time. Our goal is to get the actual retrofit work done as soon as possible. There is no risk to the traveling public using this bridge.

Prior to receiving any feedback from the audit, the Department took several steps to deal with some of the concerns ultimately raised by the audit. The Department:

- Created a separate Bureau of Structures to consolidate all structures-related functions into a single bureau in order to better focus our efforts on structures and bring more rigor to our processes. Prior to this time, structures and roadways were contained in one bureau.
- Initiated an information technology project to consolidate structures design and inspection information now contained in several different databases. This will provide a single source of input and output data. It will also enable automatic updating of Average Daily Traffic data into the bridge files.
- Instituted an annual process to ensure consultant evaluations are done in a timely manner.

Thank you for the opportunity to comment on this audit. As you have demonstrated, an independent review of our program can point out areas where we can and should improve. We will be further evaluating the LAB recommendations. We're pleased the audit did not point out any actions that have compromised the safety of the traveling public. The safety of our bridges and the traveling public will continue to be taken very seriously.

Sincerely;



Terry Mulcahy, P.E.
Secretary